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CONTENTS.

SUMMARY: —
The Dedication of the Roman Catholic Cathedral at New York. — Design of the Building. — The Chicago Custom-House Trial. — Continuation of the Evidence. — The Interoceanic Canal Congress. — The French and American Projects. — The Tenth Report of the Massachusetts Board of Health . . 169
ON THE RELATION OF ARCHITECTURE TO UNDERWRITING. I. . . 170
THE ILLUSTRATIONS: —
Competitive Design for the Union League Club-House, New York. — Design for Christ Church, Germantown, Pa. . . . 173
NEW YORK YARDS. II 173
CORRESPONDENCE: —
Letter from London. — Letter from New York 174
ROMAN ANTIQUITIES AT LYDNEY PARK, ENGLAND 175
COMMUNICATION: —
The Grand Central Depot Roof again 176
NOTES OF EXPERIENCE AND INEXPERIENCE 176
NOTES AND CLIPPINGS 176

THE dedication of the Roman Catholic Cathedral of St. Patrick, in New York, on Sunday, was a noteworthy thing, for the cathedral, designed by Mr. Renwick, is by far the largest and costliest church that has ever been built in our country, or on this side the Atlantic, being much larger than the Cathedral of Montreal. For a detailed description and an illustration of it we will refer our readers to our number for January 5, 1878, only stopping to recall here some of its main points. It is planned on the model of the Gothic cathedral of the fourteenth century, having a nave and choir, transepts, aisles, apse, and lateral chapels. Its dimensions are not much less than those of a cathedral of the first class. The transverse section of the nave and aisles is indeed almost identical with that of the Cathedral of Chartres, the whole inside width being ninety-six feet, of which half belongs as usual to the nave, and the main vault one hundred and six feet high. It is shorter than Chartres, however, by one bay each in the nave and the choir, and narrower by one in each transept. In fact it suffers in general effect, as modern churches always do, from being rather short for its height, a fault which will not be lessened when its now unfinished spires are carried up to their intended height of three hundred and thirty feet. The peculiarity of its plan is that although the choir finishes with an apse, as in the French cathedrals, which shows in the clerestory, the line of the apse is lost in the lower story, not being carried out in the French fashion by a *chevet* of radiating chapels, nor even by an encircling aisle, but lost in a square termination as in an English church, the east wall being crowded in so as to leave a bare passage-way in the place of the usual ambulatory. This treatment, which is probably due to the small dimensions of the lot on which the Cathedral stands, detracts the more from its due length, and costs the building one of the characteristic beauties of outline which belong to its prototypes. Within, the church shows again the complete ordonnance of a Gothic cathedral of the fourteenth century, with an ample triforium-gallery and high clerestory, a range of chapels lining the aisles between the buttresses, and a simple *lierne* vaulting, if we remember rightly. Most of the windows are already glazed with French stained-glass, by Lorin of Chartres, in subjects from the Bible and from the lives of the saints. An elaborate reredos and altar are already in place. The Cathedral is said to give room for fourteen thousand persons sitting, or nineteen thousand standing, a capacity equalled as yet among us only in temporary "colosseums" or "tabernacles." The cost thus far is said to have been about four millions of dollars.

THIS building has been rather severely handled in a clever article in the February number of the *Atlantic Monthly* by Mr. Clarence Cook. His criticisms are justified in the main, and yet they do not give a fair impression of the building, or of its architect's part in it. We have pointed out some faults in the general design; there are others in the execution. The stone of which the church is built is inferior, as Mr. Cook says, and would impair the effect of almost any important design. There are a good many makeshifts and shams in the building, but we need not assume that they were contentedly accepted by the architect. The inner walls of the nave and aisles are not of natural stone, but of artificial stone, or *béton;* worse than this, the vault is of lath and plaster. But the *béton* lining of the wall is as good as brick, is a kind of brick, in fact, which we need not condemn, although we should much prefer to see it give place to stone. The plaster vault is unpardonable; but we may believe that the architect, who had counted on building an honest one of brick, was grieved in spirit when the authorities of the church forbade it, and stripped away the flying buttresses which he had provided to carry it, robbing his exterior of all its play of light and shadow. The detail of the architecture is not studied from what seem to us the best originals; it lacks spirit and refinement, and is often meagre; the glass of the windows ought to have been got from England, and not from France, though probably that would not have been permitted in a Roman Catholic church. But with all these shortcomings, it is well to remember that the undertaking is a grander one than we are used to seeing, and that some of the grandeur that belongs to it remains to it for all its faults. A painstaking reproduction, on an adequate scale, of a mediæval cathedral is a lesson not without value to those who are not familiar with the originals. From the interior, making allowance for its faults, but not forgetting them, we may get a fair impression of the effect and general character of a church of the first class. The proportions and lines are very good, the scale is noble, the grouping and arrangement are the real thing, the embodiment of the long experience of the Middle Ages. The Roman Catholic Church is the only body which would have dared attempt such a structure among us. Its authorities here are not educated, nor its means adequate, as yet, to the proper carrying out of such a conception. In fact, there is no association among us which could be expected to raise the funds to carry out such an undertaking with due thoroughness and completeness, when it is not to be looked on as a paying investment. It is beyond the reach of any but state finances. The Cathedral may have been built a generation too soon, or it might have been better to build it in a different form; but there is something to be learned from what we have got and something to be enjoyed in it.

THE interest of the Chicago Custom-House trial has abated with the discharge of the most prominent defendants, Messrs. Potter and Hill, and with the assurance, which the public may receive with confidence and thankfulness, that their responsible officers have been faithful to their trust. The case is now narrowed to the prosecution of the contractor and his confidential clerk, with the superintendents and one of the foremen, the other foreman, Mr. Wheaton, having been discharged with the supervising architects, as we mentioned last week. The words of the judge to the jury concerning the charge against Mr. Potter of collusion with the contractor were clear and decisive enough: "His actions and his words were not merely a remonstrance but consisted of active opposition [to the contractor], which was persisted in, in some respects, even after the rulings of his superior officers had been against him." And again: "The same, although it appears perhaps in a less degree, because the defendant Hill came into office at a later stage of the work upon this building, — the same, I think, appears with reference to that defendant." As for Mr. Wheaton, so far as we have seen, his name was not once brought forward in the evidence submitted by the prosecution. Of the probable success of the remaining prosecutions it is not proper as yet to express an opinion: but it is fair to say in view of these acquittals that, whatever may be the indications of the evidence, the presentment of the grand jury in itself has lost all weight. One who considers the extreme annoyance and inconvenience to which these gentlemen have been heedlessly put by their prosecution, — the interruption of business, the loss of money and of time, the slur upon their good name, the suspension, as a matter of official etiquette, of the Supervising Architect during five months, which have been the only fruit of their headlong indictment, — will not think that the leading counsel for the defence stretched his point very far when he declared that the indictment of his client, without the grand jury knowing whether he was in favor of the alleged wrongs or disapproved of them, but simply because he was an officer of the Government coming within the statute of limitations during the time when the work on the building was done, was an outrage.

THE further testimony submitted in the trial, so far as it has reached us, has gone to prove the unsatisfactory quality of much of the stone used in the building, and the excessive cost of cutting the upper (attic) story, — points which were pretty well es-

tablished before, — and to show, which it does clearly enough, by what system the cutting was made so good a thing for the men who did it and, by implication, for the contractor. Conflicting opinions were given as to whether the sawing of the stone was to the advantage of the Government or not; but no evidence was adduced to bring home any fraudulent intent to the officers of the Government. Indeed, one of the unexpected characteristics of the prosecution has been the absence of any attempts to prove direct collusion. The testimony of time-keepers and stone-cutters introduced by the defence justifies many of the accusations that were common when this matter was first made public, of idling, delaying work, and even absence, ball-playing, and the like, among the workmen. It was testified that Mr. Prussing, while superintendent, was at least indulgent to the men who were reported and docked or discharged for idleness, generally replacing them on the work for subsequent trial. On the other hand it was abundantly shown that he found fault with the slowness of the men, and that they were careful to keep a good lookout for Mr. Prussing's visits, and fall to work when word was passed that Big Square, as they nicknamed him, was coming. The habit of soldiering, indeed, was, as the building went on, developed into a careful system, in which the time-keepers joined with the men. A regular relief watch was organized, the men taking turns, an hour at a time, in looking out for their superintendent. The effrontery with which some of the time-keepers testified to their own collusion with the men was no less than amusing; one of them acknowledging that as the work drew near an end they decided that they must nurse it, and at once fell to matching pennies, reading newspapers, and the like, while the men wandered off to play base ball, or to watch the steamers on the lake.

The Interoceanic Canal Congress just held at Paris bids fair at the time when we write to come to definite and profitable conclusions. According to the latest telegraphic reports the difficult comparisons between the merits and costs of the half a dozen different routes which have been advocated before it are nearly finished, and it is likely that before this paper is issued our readers will have heard that the Congress has reached its final decision and adjourned. The great question has been between the route recommended by Lieutenant Wyse of the French Navy, and favored by M. de Lesseps, which, as we have more than once mentioned, crosses the Isthmus of Darien at its narrowest point, from the Bay of San Miguel, by an enormous and costly tunnel seven miles through the mountains; and the longer routes, which avoid tunnelling by following water-courses and using locks, among which the favorites are the Atrato-Napipi route, south of the San Miguel line, surveyed by Commodore Selfridge, and the Northern Nicaragua route advocated by Admiral Ammen. This last is commonly spoken of as the "American route," — the San Miguel being called the "French route," — and is the longest of all; but makes most advantage of natural waters, and besides being apparently the least difficult to construct promises the best and surest supply of water for navigation. Another route, which has found favor and was pressed by Mr. Menocal, engineer in the U. S. Navy, is known as the Panama route, which, taking advantage of the Chagres River, follows nearly the route of the Panama Railroad.

M. de Lesseps gave strong support to the Darien scheme of Lieutenant Wyse, arguing that the essentials of a ship canal were that it should be a sea-level canal, without locks, and with good harbors at each mouth. These conditions the Darien scheme would satisfy; but the Committee on Technique, to whom the various projects were referred for estimates of cost, staggered the Congress by reporting that the lowest estimate for this route, under the most favorable circumstances, was one hundred and sixty millions of dollars, — a cost which would be indefinitely exceeded if water were met with in tunnelling, — while that of either of the rival routes would be about one hundred millions. The English member of the Congress, Sir John Hawkshaw, clinched this argument by declaring that a sea-level canal at this point would have to carry the water from the adjacent hills, and would be overflowed by it; that in time of freshets the whole section of the ship tunnel would be insufficient for the water that would pour into the canal, while the current would be enormously rapid. This speech carried special weight, because Sir John had spent three years on the isthmus in times past, and knew its topography. Together with the estimate of the Committee on Technique, it seems to have been enough to turn the Congress against the Darien scheme. It was thought that the French engineers, if they found this project rejected, would give their support to the Atrato route as that which was most nearly like their own, since, though much longer, it would also avoid lockage by tunnelling, of which in this route there are only three miles. It is in fact the old question, which comes up again and again in engineering schemes, between undertaking difficult and costly construction in the hope of satisfactory and easy working at the end on the one hand, and on the other a cheaper construction with greater cost and difficulty of operation. The daring spirit of the French engineers usually leads them to choose the first alternative, and the end is very apt to justify them. The English and American engineers, more afraid of first cost, and somewhat less influenced by pride in the perfection of their work, are much inclined to choose the second. Appearances seem to show that the easier constructions will carry the day in the Congress. This of course gives it only an advisory authority, but it is not likely that capitalists will be more venturesome than the Congress. Undoubtedly the canal will be built at some time, and, considering the timidity of capital, it will probably be built in the cheaper way. But lockage is a most vexatious and expensive impediment in the use of a ship canal; should a high-level canal be built and be found profitable for commerce, it would not be very surprising if in another generation it were discarded, and a second built at the level of the sea.

The Tenth Annual Report of the Massachusetts State Board of Health is before us. It contains two or three papers of more or less value to architects. Among them is an essay on asylums for the insane, prepared at the especial request of the Board by Dr. Clouston, the superintendent of the Royal Edinburgh Asylum for the Insane, in which he urges the most advanced views concerning the arrangement and construction of insane hospitals, arguing strongly for the subdivision of the patients and the disuse, as far as possible, of all appliances for confinement, or even of restraint, and supporting by his experience at Morningside his conclusion that a large proportion of the insane "can be managed and treated without any special contrivance of buildings, and that many of them can live in houses just like those inhabited by the general population." With this idea he argues for the utmost cheerfulness and freedom in the arrangement of buildings, taking in fact the Swiss hotels as a type to be imitated, and depending as little as possible on bolts and bars. Some of Dr. Clouston's ways of carrying out these principles would stagger the people who have been complaining bitterly of late against the costliness of certain of the American asylums; as for instance when he says that in the sick ward for paupers lately built he has used for the windows only plate glass in large panes. He gives a model plan for an asylum, which should hold two hundred patients, including the average proportion of different cases, — acutely excited, mildly insane, sick, convalescent, etc., — dividing them among different buildings more or less detached and sometimes widely separated. He dwells much upon the importance of association, even preferring common dormitories to separate bed-rooms, and recommending a common dining room with a *table d'hôte*. He would supply drawing-rooms, conservatories, billiard-rooms, and a gymnasium, and lays stress on the wholesome influence of plate-glass, inlaid-floors and tiling, and decorated walls. The plans are accompanied by a description which suggests many important details of planning and fitting. There is also a paper on Common Defects in House Drains, by Mr. Eliot C. Clarke, which tells a good deal that experts will recognize as true; a Contribution to the Study of Ventilation, by Dr. Edward Cowles, giving the results of some experiments and examinations made at the Boston City Hospital under his charge; a paper by Dr. Frederick Winsor on coal gas from heating apparatus; as well as essays of less technical interest to architects, on the growth of children, and on Physical Education and Hygiene in Amherst College, etc.

ON THE RELATION OF ARCHITECTURE TO UNDERWRITING.[1] I.

Mr. President and Gentlemen:

I have been requested to address you on "The Relation of Architecture to Underwriting," a theme which seems very pertinent to the present occasion. It is one which may be presented with equal interest by an architect or an underwriter. In the present instance,

[1] A paper read before the New York State Association of Supervising and Adjusting Insurance Agents, at Syracuse, May 20, 1879, by Mr. P. B. Wight, architect.

perhaps more by accident than otherwise, it is presented by an architect. It is unavoidable, therefore, that it will have to be considered from the architect's point of view. We will know more about it when we hear from the other side, — the profession of underwriting, to which most of my audience belong. But I trust you will not infer that this is a subject for discussion or controversy. I allude rather to the fact that in considering it we may come to a better understanding of what it is, from the opinions of the two professions concerned, than one.

These professions have been brought into more or less intimacy, — much less than would be good for the interests of both. Therefore, standing as it were alone before you, I can but offer a few suggestions with the hope that they may lead to a more serious consideration hereafter of the many problems connected with the art of building in which the interests of underwriters are deeply concerned.

Though you rate a building according to its supposed risk in case of fire, I will take it for granted that on general and broad principles you desire that risk to be as low as possible. Any other consideration of the subject would be based upon the supposition that insurance was a species of gambling, rather than a science based upon general averages. If there are any who hold such views, as I have often been informed, it can only be regarded as a misfortune to your profession.

It is of the greatest importance that you fully understand the nature and construction of buildings with reference to the dangers to be apprehended from both the inception and spreading of fires. It is of equal importance that the architect should inform himself, from your experience in collating statistics, as to what systems of building are least dangerous in regard to both contingencies. Architects have been soundly berated for their neglect to provide against these dangers, in numberless instances, while it is also true that in those very cases the insurers have been equally negligent in discovering the sources of danger, which should have been detected by an efficient system of surveying before the risks were taken. No amount of neglect on the part of one should escape the eye of the other. We are all seeking light and we have much to learn.

On an occasion like this I can do little more than point out what are the chief points of danger from fire in buildings as usually constructed, and suggest some remedies. By this means I may enable you to see more clearly what you have to contend with, and what, if you desire to diminish the fire risks, you may reasonably demand.

It is certainly to your interest that there be no large fires. If there were none at all your occupation and usefulness would cease altogether; but that is a contingency not to be apprehended. There are very few articles among the *contents* of buildings which are not combustible and liable to take fire, even if the buildings are not, and no fire can take place among them which will not cause *some* damage to the building which contains them. Fires very seldom commence with any part of a building, but almost always with their contents. Conflagrations in buildings once commenced are extended from two causes: one is the rapid consumption of the materials of the building, the other is the rapid spread of fire through a building, partly caused by the combustion of its contents. The one is prevented by the use of incombustible materials, the other by the separation of the several parts by natural barriers. The former is generally known as fire-proof building; the latter is known as the compartment system. Another element enters into the progress of all fires, and that is the danger of a fire in the contents destroying by its intensity the structural parts of the building, and extending from one part to another, as if a train were laid for it. The compartment system is essential for the prevention of such a contingency.

FIRE-PROOF BUILDING, SO-CALLED.

We have heard and seen much of the so-called fire-proof buildings and often to our great sorrow. Many have proved to have had in them elements of danger greater than they were supposed to obviate. But it is not my purpose on the present occasion to describe that class of so-called fire proof buildings which have proved to be only frauds and delusions when put to the test. There are plenty in existence now. You will readily know which they are when the definition of a proper standard of fire-proofing is fully understood.

Fire-proof buildings should be properly classed under two heads. The first class should be known as buildings constructed of incombustible materials, thoroughly protected from the action of fire. The second comprises buildings constructed partially of combustible materials, also thoroughly protected from the action of fire. The difference between them is two-fold.

First: The former class involves more expensive processes than the latter. Second: it is more durable as against decay and deterioration. With regard to fire-resisting qualities they may both be equally good.

It is one of the latest developments of the art of building that fire-proofing depends more upon the *protection* of the materials of construction than upon the materials themselves.

It was once supposed — and some architects still hold to the opinion — that incombustible materials were necessarily fire-proof. There are those who still contend that if all combustible materials are avoided in the construction and finish of buildings, they are practically fire-proof. This can only be the case if all the materials are brick and all the contents are incombustible. With the exception of brick there is no material which enters into the construction of modern buildings that can be considered fire-proof. But it is hardly within the range of possibility that the contents of any building shall be wholly incombustible, and it is on account of the combustible nature of the *contents* of a building that all the materials of construction other than bricks become endangered. As an illustration: the late Mr. Hatfield, at a convention of the American Institute of Architects held in Boston in 1871, mentioned that a mill at Oldham, in England, which was constructed with floors entirely of brick arches, and without beams, having iron columns for support, was destroyed in this manner: A small fire occurred on the lower floor where some lumber had been piled around one column; the column bent and broke; the additional weight thus imposed upon the adjacent columns caused them also to give way, and one after the other all the columns broke and the mill became a total wreck.

With this premise let us now proceed to consider what constitutes a fire-proof building of the first class.

FIRST-CLASS FIRE-PROOF BUILDINGS.

The material which enters most largely into the construction of buildings is brick, consequently in the principal item of materials required, nothing further is to be gained. Even bricks are not indestructible by fire, as they vitrify at various temperatures, according to the nature of the clays of which they are composed; vitrifying more readily as they contain oxides of iron. But it is necessary to take some material as a standard for the fire-resisting qualities necessary to a fire-proof building, and for all practical purposes I assume that brick possesses those qualities. All materials known as terra-cotta are essentially brick and are intended to be so considered when the word is used. The walls of buildings are in nearly all cases constructed of brick. Stone buildings are exceptional in this country. A few churches and mills are constructed entirely of stone, but only buildings, the main parts and especially the interior of the walls of which are constructed of brick, can be considered as fire-proof. Walls constructed entirely of concrete, however, are nearly equal to bricks for fire-resisting qualities, but concrete buildings are exceptional, and, being more expensive than those of brick, are not likely to be built in great numbers. Exterior stone facing on brick walls does not materially affect their fire-proof qualities. There are but few natural stones that have any fire-resisting qualities. The damage to the exterior stone-work of a wall is as likely to be caused by fire in an adjacent building as in the building itself. In the latter case the damage is generally caused by fire issuing from windows. This constitutes one of the insurable elements of a first-class fire-proof building. No wall built entirely of stone can be considered to be fire-proof.

Before proceeding further it may be well to explain that the expression "materials of construction" herein used is intended to apply to those materials which sustain weights and are subjected to strains, whether compressive, transverse, or torsional, and does not apply to finishing materials, such as doors, door-trimmings, windows, floors, and other parts which are introduced after a building is constructed. It applies to the structural frame-work, the destruction of any part of which is likely to result in damage to the whole structure. In a first-class fire-proof building the amount of insurable property depends upon the amount of combustible and destructible materials used in the finishing. In such a building, constructed to resist the action of fire in the finishing materials and contents, there should be no occasion for a loss in the structural portions, but only a possible damage to the finishing portions on account of their exposure to the burning of its contents.

Now, such a building, to be theoretically fire-proof according to the standard I have assumed, should be constructed entirely of brick, — walls, floors, partitions, and roofs. But the purposes for which modern buildings are required are such that the universal employment of brick is impracticable, and other materials capable to sustain compressive, torsional, and transverse strains must be employed. In a first-class fire-proof building in which the structural materials must be not only incombustible but indestructible by time, no material is more practicable or economical for these purposes than iron. Iron is therefore used in its two conditions, wrought and cast. The former has all the qualities requisite in a building material, the latter is only valuable as a material to resist compression, — though for short lintels subjected to transverse strains, it is valuable to a limited extent. Wrought-iron only can be used to advantage for long lintels, girders, and beams. Both kinds may be used for columns or piers.

But, notwithstanding the valuable qualities of iron as a fire-proof building material, as just stated, it is not a fire-resisting material, and fire acts upon it in a different manner than upon any other material of construction. It is not reduced in quantity, but diminished in strength by the action of heat. Mr. F. Schumann, the mechanical expert of the office of the Supervising Architect of the Treasury Department, says that iron used with a co-efficient of safety of three, at the normal temperature, loses all practicable strength at 977° F. Beams and girders will sag, especially if the lower parts of them are exposed, as is most likely to be the case. Their expansion at these temperatures will force walls apart and destroy the integrity of brick-work. In the Chicago fire of 1871, the walls of the *Tribune* building were more damaged than the iron floors. They were so much cracked by the expansion of iron beams that it was necessary to take them down. At this temperature columns expand sufficiently to force the floors above their proper level. The more they expand the greater

becomes the strain on them, for they are endeavoring to *lift* the loaded floors which are held down by the walls. In this condition a stream of water thrown on them will cause the side upon which the water strikes to contract, and the column thus overloaded and bowed out of a straight line breaks. This accounts for the many broken and slightly bent iron columns often found in the ruins of buildings in which the heat had not been sufficient to melt them.

Consequently it is essential that all constructive iron-work should be protected by an incombustible and non-conducting material. Whatever is used for protecting purposes should be so effectively secured to the iron work that it is not likely to be removed by any contingency which may arise during the progress of a fire.

The principal use of iron in fire-proof buildings is for the construction of floors. The simplest form of floor construction is where the beams rest on walls at both ends. All iron floor-beams now used are of the same section, differing only in size and weight, and are known as I beams. The problem of fire-proofing floors consists in the method employed to bridge the spaces between the beams, which are seldom less than three feet or more than six. The simplest, strongest, and cheapest is the brick arch. It has been used in fully one half of the buildings with iron beams that have thus far been constructed. But it gives neither a flat ceiling nor a level floor. If the ceiling is required to be flat it must be suspended beneath the beams. In a large majority of iron-beam and brick-arch buildings these suspended ceilings consist of wooden strips and laths plastered, leaving spaces under the arches from wall to wall. There are several methods in use, however, by which these ceilings may be made entirely of incombustible materials, so that they will form a protection to the beams and arches. The floors are made level when brick arches are used by filling in the spandrils with concrete. The objection to brick arches as usually employed is that they leave the lower flanges of the beams exposed; and these are the parts which it is most important to protect from fire.

The principal method heretofore used in protecting the lower flanges, when brick arches are used, has been to suspend wires or wire-netting or small bars of iron under the beams, and to cover the same with plaster. The most effective method is to employ large skew-backs of brick or concrete, made so that those on opposite sides meeting at the bottom will form a complete inclosure of the lower half of the beam. The best material for the skew-backs, as well as for the bricks forming the arches, is a body of clay and saw-dust, burned like ordinary bricks, called porous terra-cotta. This material possesses all the strength required for bricks in such places. Thus far skew-backs, such as I have described, have been used in only one structure that I know of, the Mitchell Building at Milwaukee. Ceilings of rooms thus constructed when plastered on the bricks look as if supported by very large beams, and it is better in all cases where such a thoroughly fire-proof system is employed not to introduce a suspended ceiling.

A method of bridging the spaces which has been largely used consists of arches of plain or corrugated sheet-iron resting on the lower flanges of the beams and filled above with concrete, which is levelled up to the tops of the beams. These are substitutes for brick arches and have the same defect of leaving the lower flanges of the beams exposed. The concrete arches thus formed over the sheet-iron will, if composed properly, form a sufficient support for the floors, independent of the iron arches. These combination arches will resist heat quite as well as brick ones, and if they were combined with protecting skew-backs would make good floors. To avoid the necessity of suspending ceilings where they are desired to be flat, what are termed flat-arches are employed. These have the great advantage of lightness of construction. They may occupy the full depth of the beams and leave the floors and ceilings flat. They are made of hollow blocks, which are so put together that they have the construction, if not the form, of an arch. The joints radiate from a common centre, and one internal rib takes the form of an arch. They are made of three materials: 1st. Hard pottery or tile. 2d. Porous concrete. 3d. Porous terra-cotta. The first is the least fire-resisting, the last the most so. The undersides of these flat-arches are slightly lower than the beams, and the protection afforded to the beams consists of a body of cement, or plaster, which is held by the edges of opposite blocks. To this protection is added the plastering, which covers the whole ceiling uniformly, and, by being incorporated with the whole mass of beams and arches, forms part of the fire protection. Hard tiles are brittle, and, if heated on one side more than on the other, will crack. Porous concrete is made light by being diluted with furnace slag, or ground coke. The best made is composed of lime of Teil and plaster of Paris. The plaster is used to facilitate the manufacture in the quick setting of the material. This material will not crack under heat, as it is very elastic, but on account of the presence of plaster, which has an affinity for water, when it is heated, may soften by the absorption of too much water. If covered by a coat of cement or mortar, however, it is not open to this objection. Porous terra-cotta will neither crack under heat nor deteriorate by the absorption of water when heated. It is tough and elastic, and for all purposes of fire-proofing is the best material yet known. The last described material and construction is the best to employ where flat ceilings are desired.

The above methods of fire-proof floor construction do not comprise all that have been used or invented, but are such as may be considered practicable in all cases. The solid concrete floor has been little used, and has much to commend it. The present occasion will not permit of a description of its construction in detail, as several methods have been used which employ more or less iron. Suffice it to say, however, that as long as the beams are completely encased, such floors may be considered to be thoroughly fire-proof.

A roof, where supported on brick walls, may be considered and treated the same as a floor, only of lighter construction. There is no reason why it should be protected on either the upper or lower side less than a floor.

When the floor spaces of a building are large, a more complicated system of construction is necessary. This usually consists of columns and girders. Piers and arches may be used for the same purpose, but whatever form these supports take they are substitutes for walls, and have the same work to do, hence they should be fully as fire-proof as walls. The natural progression from walls to this form of construction is as follows: The first step is a wall with arched openings. If the openings are so large as to reduce the spaces between them to the point of weakness, these spaces are thickened and become piers. The column is a substitute for a pier, and the girder or lintel for an arch. Iron is the material in which these can occupy the smallest space, hence iron is a necessity for such purposes. In most buildings as heretofore constructed, these parts have been the most vulnerable to fire, and there are numerous instances of the destruction of buildings supposed to be fire-proof from this cause alone. The most notable was the Custom-House and Post-Office in Chicago, the entire interior of which was destroyed by fire on October 9, 1871. A new building to replace it, and costing $3,000,000, is now nearing completion, and, except in the fact that it has incombustible plastered ceilings suspended beneath the beams, is in no respect superior in fire-resisting qualities to the former structure. The danger is increased when, as often occurs, the lines of columns and girders carry brick walls, — in stories above the first or second. It is in view of this danger that the building law of the city of New York requires that iron columns having to support interior brick walls shall be covered by some kind of fire-protecting material.

Iron columns can be made entirely secure from the effects of fire by a covering of fire-resisting material of not less than two inches, provided it is properly secured to the iron-work. The best method of securing a fire-proof material is by screws put directly into the iron. The material may be porous terra-cotta, or porous concrete, cast in blocks. These materials possess within themselves the most important of non-conducting materials, — air; hence no special air spaces are necessary, — and they can be solidly cemented against the iron. The best form of column for fire-proofing is a small round column with four projecting flanges from bottom to top. Blocks three inches thick may be set within the flanges, projecting one inch outside of them, and held in place by small plates, screwed down to the flanges. Round columns in existing buildings can be covered with sectional pieces, one and a half inches thick, set in courses and secured at the horizontal joints by iron hoops inserted between the pieces. The Phœnix wrought-iron columns, being flanged by their construction, may be easily fire-proofed by setting gores of fire-proof material between the flanges and securing them with buttons hooked over the rivet heads.

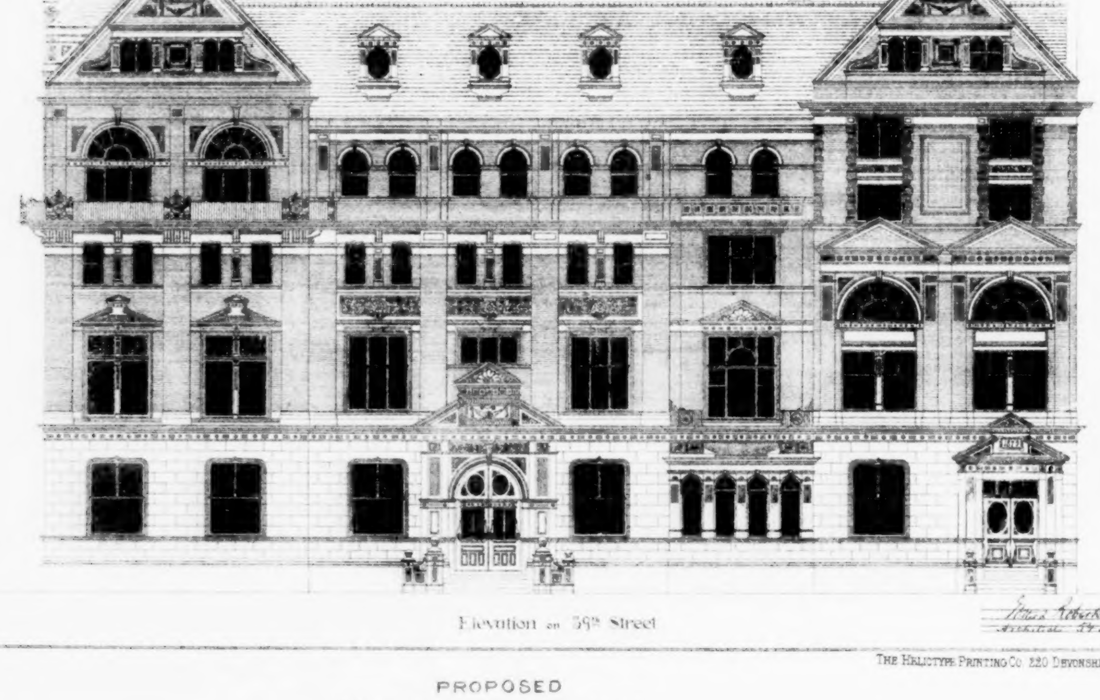
Girders are generally made by placing two I-beams together. They can be covered with fire-proof blocks two inches in thickness. One piece should be placed on each side and one under the bottom. The bottom, being dovetailed, can be held by the side blocks, which are so formed as to admit the dovetailed block. The side pieces will rest on the flanges of the girders and may be secured to the iron with countersunk screws. Sometimes girders are covered with iron laths, or woven wire. But this has generally been done to provide for plastering and not with a view to making the girders fire-proof.

A still more complicated form of construction is required when large spaces of floor have to be supported without columns. In doing this, the architect must resort to truss work. The trusses are sometimes inclosed in partitions according to the plan of building. In that case, if the partitions are made entirely of fire-proof material, so as to cover every part of the truss, the construction will be safe. In case the truss is exposed every part of it should be covered in detail, following the methods used on columns or girders, according as they may be most easily employed.

In the case of a roof covering an extended space, and requiring supporting trusses, all the parts of the trusses should be covered individually as last described. Where trusses are employed, a light covering for the roof is essential to relieve the trusses of too great a weight. Among numerous methods in use the best is the following: Light T-iron purlins are placed sixteen inches from centres. Blocks of porous terra-cotta or concrete, two inches thick, are set in mortar on the flanges of the T-iron. As this leaves part of the T-iron exposed below the blocks, the purlins are covered by placing tiles six inches square and one inch thick on the underside of the blocks, and covering the irons. They may be held with nails and then plastered over. The bottom surface thus becomes a continuous surface of fire-proof material. When this has a coat of mortar and cement it will protect the roof effectively from any fire that may occur under it. The upper surface of the fire-proof blocks may then be covered with metal or slates nailed into them, or a cement or composition roof may be placed directly upon the blocks.

Partitions, as distinguished from partition walls, are such as may be carried on floors for subdivision into rooms. Various methods for

LONGITUDINAL SECTION.



Elevation on 39th Street

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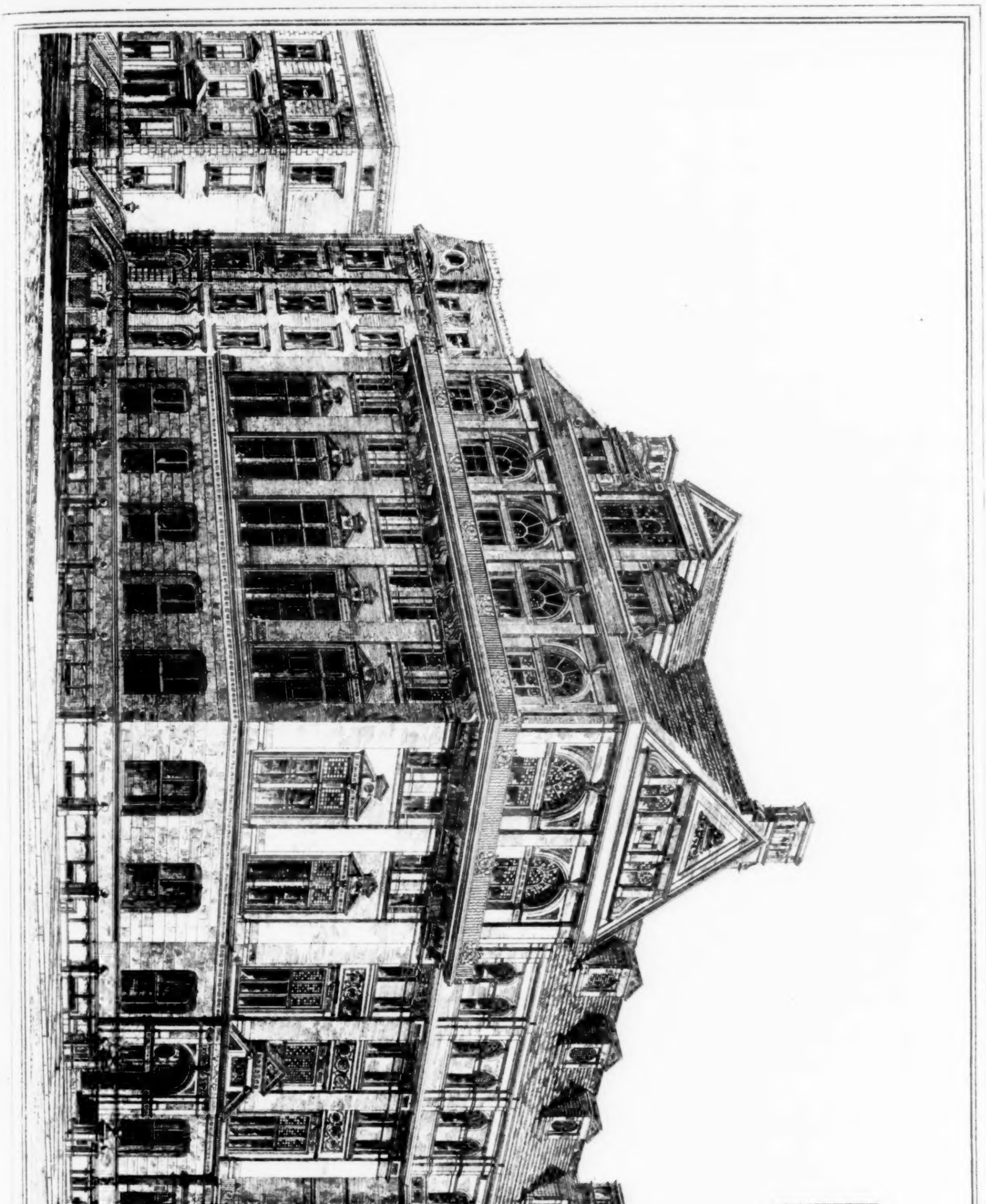

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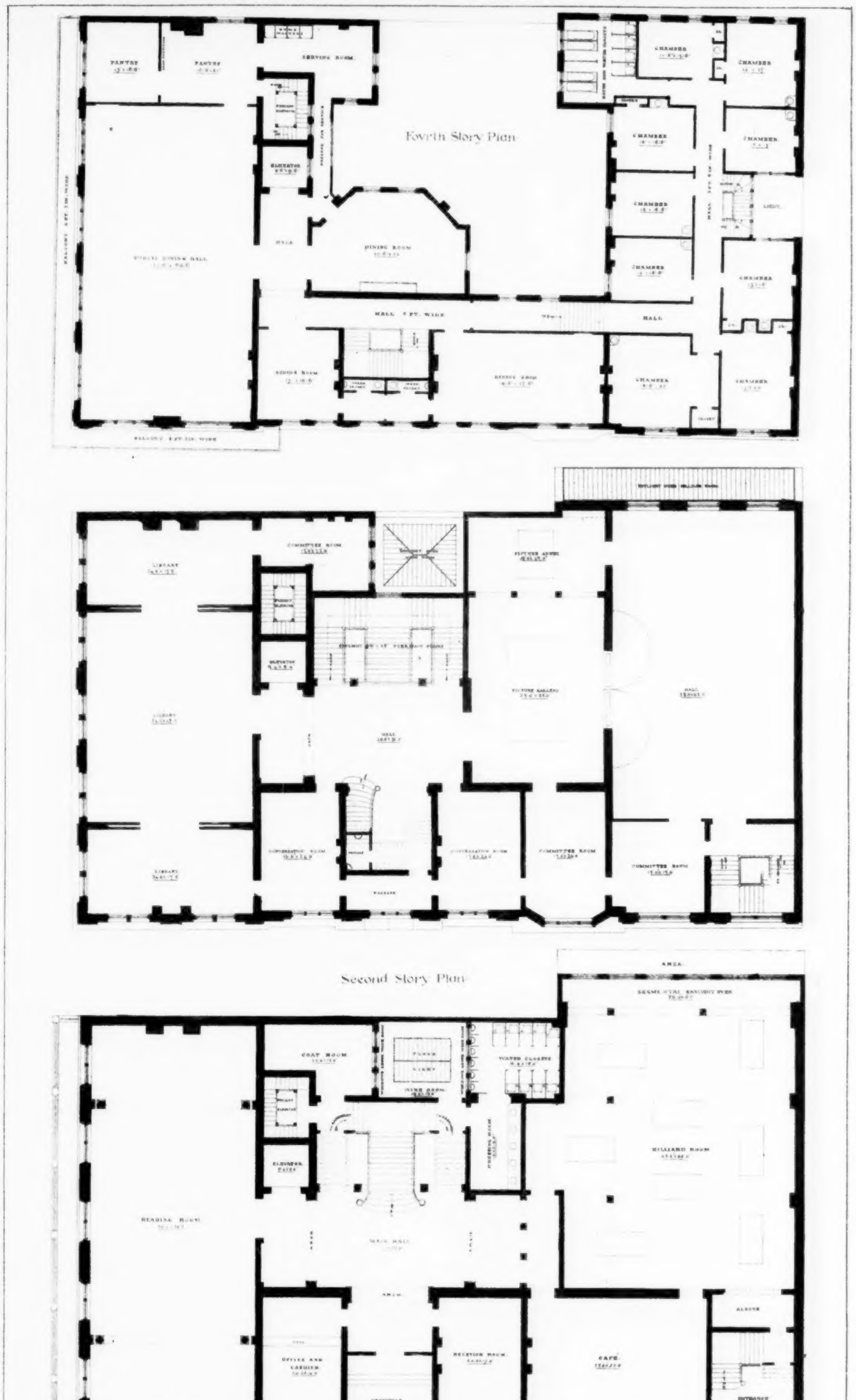

PROPOSED
Union League Club House

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constructing these with incombustible materials have been employed. They have been made of brick, eight inches thick, or four inches thick strengthened with iron studs, or of studs covered with iron lath or woven wire, and plastered. But the kind of partition now generally used, and valuable for lightness and economy of construction, is one built of hollow blocks of light porous concrete, or porous bricks. Such partitions may be from four to six inches in thickness, according to length and height. Plastering is applied to them directly. They are especially convenient on account of the ease with which they may be moved or altered.

THE ILLUSTRATIONS.

COMPETITIVE DESIGN FOR THE UNION LEAGUE CLUB-HOUSE, NEW YORK, N. Y. MESSRS. POTTER & ROBERTSON, ARCHITECTS, NEW YORK.

DESIGN FOR THE RESTORATION OF CHRIST CHURCH, GERMANTOWN, PA. MR. H. R. MARSHALL, ARCHITECT, NEW YORK.

THIS design was prepared in consequence of the destruction of the old church by the gale of October last.

NEW YORK YARDS. II.

THE owner of a piece of land held only for light-and-air space, perhaps undervaluing the light and air secured by it to himself or others living on his property, and not feeling concerned in the light and air secured by it to other people and their families or tenants, is tempted to try to make a further use of it. And as, in a city, the only ready use which he can make of such a piece of land seems to be to build on it, he is tempted to build on it, either for his own use and pleasure, or to make it more profitable property. If such land forms the rear part of the lot on which his own dwelling stands, he is perhaps daily reminded that he has no use for so much land merely as a yard to dry clothes in, while he must pay a considerable sum yearly for it in interest on its cost and in taxes.

The system of "back buildings" prevalent in Philadelphia and Baltimore, in many respects excellent, by which the full width of the lot is not covered while good ventilation is secured, is unknown to him; so he diminishes the light-and-air space in the rear of his house, not by the least harmful, but by the most harmful, method. He makes an addition to the depth of his house, and of the full width of his lot. Thus, in the upper part of New York, where the most costly houses stand, the yards are gradually being filled up. People deprive themselves and their neighbors of light and air with every feeling of self-approval. What people do towards diminishing the air-spaces of the city, in ways bad enough behind their own houses, they do in worse ways behind houses intended for tenants, whether hotels, the larger boarding-houses, apartment-houses, or tenement-houses. It is only in the case of the latter that we are brought face to face with some of the worst results of this growing state of things, the evils of which few are willing to recognize because they see no remedy for them. Whatever evils and discomforts result from over-building are brought about, in New York, by a system actually intended to prevent over-building, and to secure to all the dwellings of all the inhabitants of the city abundance of light and air. New York was laid out on the theory that every householder would need a large yard at the back of his house, and on the further theory that every head of a family would be a householder. And so sure of their theories were those who laid out the New York deep-lot system, that they ingeniously and with the highest purposes made the system such as would force upon every purchaser of real estate land enough for a large yard in addition to the land used for houses and other buildings; for they had a further theory that houses would be rarely built more than fifty feet deep, at the outside. Basing their system on assumptions, which the results have proved to be wholly erroneous, they proceeded to secure wide and abundant air-spaces by practically forbidding purchasers to buy land in pieces of less than one hundred feet in depth, by simply making the purchase of pieces of land of less depth impossible. They secured the holding of the land continuously in such deep parcels, by making it practically impossible to sell off any portion of it, except by dividing it longitudinally, and by making it impossible to get at the back of a lot except through its front portion. All their methods were ingenious and have been generally successful, — too successful. While all their purposes were good, the general result has been disastrous. We see here, as in almost every known case of an attempt to bridle the future, and to interfere with natural laws of demand and supply, a failure to secure the good result intended, and the development of unforeseen evils which would not have arisen but for that attempt.

The genius of good intentions seems to us at this moment thus to address the rich New York real estate owner: "I wanted you to have the back of your house well lighted and ventilated. With this view I have been in the habit of forcing you to buy a piece of land in the rear of your house for a light-and-air space, and for which you could have little other use. And in order that it may be kept consecrated to that use, and to make certain that you may not part with it, I have prevented all access to it except through the front of your lot, and thus made it practically impossible to sell one part of your property without selling the other part of it." Of all this the motive is good, the method is ingenious, — but the result is disastrous. "Saddled with a piece of land which has cost a large price but which you cannot sell off, you endeavor to get more out of it than merely light and air. You conclude that it gives you more light and air than you want. At any rate you can do with less; and you proceed to show with how little you can do. It seems that the richer you are the less light and air you care for, and the bigger you build your house, by encroaching on the open space for light and air in the rear of it. Thus the very measure, which I have with so much forethought and care taken to secure to you plenty of light and air, has led to the precisely opposite result.

"Wishing to secure the same benefit to your neighbors that I had intended to secure to you, I had taken care to extend to them the same rule which I had made for you. In order that all houses might have plenty of light and air in the rear, no property owner was allowed to buy, in most parts of the city, less than a hundred feet deep of land. In this way I hoped to secure to every individual in the community the same advantages that I had intended to secure to you. Judge, then, of my affliction when I see you not only shutting out light and air from half the rooms in your own house but also cutting them off from your neighbors by the bigness of your main or rear buildings. And judge of my further affliction when I find that in so doing you have set your neighbors a bad example, which they are all hastening to follow. Scarcely is your fine dining-hall, library, and picture-gallery completed, when I see many of your neighbors adding to the depth of their houses: some with one room, some with more, according to their ability. For a moment I had hoped that the bad example which your wealth enabled you to set, the lack of means on the part of most of your neighbors would hinder them generally from following. But I soon see that I have again miscalculated, and observe also that the deepest of all the additions is that put on an adjoining house so as to convert it into a boarding-house, where the number of rooms to let, rather than light or ventilation, is naturally the main consideration. But the boarding-house does not long remain the deepest house in the neighborhood, for the house adjoining it is now being converted, by a few alterations and by a still more extensive adding-to in the rear, into 'French flats,' that is, into such tenements as are called by that name. This last building covers more ground and shuts out more light and air, from both its occupants and its neighbors, than even the 'improved' tenement-house farther down the street, where the depth of the lot which I had forced upon the owner, and the ordinance forbidding 'rear buildings,' if *separated by a space for light and air*, from the main building, had resulted in the building of a house some eighty feet deep, though but twenty-five feet wide, and with nominally four families on a floor (though really often twice that number, or more), each of which lives in a dark, unventilated cave, about forty feet deep and but twelve feet wide, very conveniently divided into a suite of rooms, only one of which has windows, light, or air.

"When I see what a bad return has been made me as a result of my efforts to secure plenty of light and air in your house and your neighbor's, I am tempted to let you alone in future, more particularly as I observe that in a neighboring city where people have been let severely alone, to cut up blocks with intersecting streets and lanes to any extent, no bad results of any kind have arrived. That which I had attempted to secure by legislation has been secured when people have been left to take care of themselves."

How can one look out of a back window of the ordinary two-room-deep house, of the days when the deep-lot system of the upper part of New York was adopted (if any such house be now to be found), and contemplate all the yard space which a continuation of such houses all around the block would leave in the centre of the block, and not be struck with the ample provision of light-and-air space which would be so provided? And then how can one look at the number of dining-room extensions of the houses all about him, behind each one of which is a drawing-room lighted only by a borrowed light, and getting air only through an adjoining room, and not be struck with the contrast between what was intended and what is? Or where a whole house is three rooms deep, how can one sleep in the middle room without compunction if shut off from the rooms on each side of it? Or, if for the sake of air and ventilation he is obliged to use two rooms where one would serve, not feel a sense of regret when thinking of the great majority who cannot afford such a luxury? The making a luxury of fresh air, so that only the rich can indulge in plenty of it, is a most regrettable result of the well-meant New York deep-lot system. And who will not smile at the simplicity of the ideas of those who laid out New York with a lot of ground so large as 25 by 100 feet for every householder, and expected him to be rich enough also to let half of it go unbuilt on and lying idle? Or at the inconsistency of such ideas with the now prevalent notion that overcrowding in New York results from the small size of the island on which it is built? And every one, if he chooses, can assure himself that, whether or not the size of the island has anything to do with New York overcrowding, still the curious fact remains that instances of just as bad overcrowding and just as unventilated tenements are to be found in Jersey City, Brooklyn, Newark, Chicago, or whatever place is nearest him, where the same system as that of New York prevails, of deep lots with narrow frontage and no access in the rear. And this although that system aimed at, and was invented to secure, to every family, a large yard; and with it plenty of light-and-air-spaces. But now that large yards are no longer needed, and are fast disappearing, the deep-lot system has proved

itself no longer fitted, whatever it may have been once, to secure the end intended. It is time it should be superseded by something better adapted to the present wants of the city. The whole subject of the distribution of space in cities should be more thoroughly studied than it yet has been. Laying aside prejudices we should be willing to examine and recognize systems which have led to better results elsewhere. Especially we should make sure whether or not as little interference as possible with the natural laws of trade in real estate does not lead to securing the best interests of the community by securing the best interests of the individuals that compose it.

CORRESPONDENCE.

ARCHITECTURE AT THE ROYAL ACADEMY.

London, May 1, 1879.

The display of architectural drawings is decidedly less in quantity if not in quality this year, than it has been for several years past. Perhaps this is accounted for by the rumor of a more than ordinary number of rejections; certain it is that several very well known drawings, which were expected to form part of the year's show, are not on the walls, and in looking round the collection it is equally certain their places are filled by works very far below them in merit, either as designs or as drawings. Why this is so is just one of those things no fellow can understand, — not even the R. A.'s themselves, we presume, — but this being the case, we must take what the council have been pleased to select from the number submitted for their inspection, as representing the architecture of the year, and look at it accordingly. A general glance will show that it is a very mixed lot, while few of the designs rise high above the average of merit. Mr. Barry among the Academicians, and Mr. Pearson among the Associates, are conspicuous by their absence, while a second R. A., Mr. Norman Shaw, sends only *one* of his beautiful drawings. Among outsiders absent, the most notable, perhaps, are Mr. Bodley, Mr. Seddon, Mr. Bentley, and, as formerly, Mr. Nesfield. In any display of English architecture these names can ill be spared, and so it is somewhat disappointing to find none of their works at Burlington House. Of the drawings that are there, about a third are those of ecclesiastic, and the remainder of secular work, of various kinds from gate lodges to town halls.

Taking the designs seriatim, we first notice No. 1069, Kew Hall, Norfolk, by Mr. J. J. Stevenson, — a rather lumpy design, in what the author would call "free classic," not very inviting as an English country residence. It is in red brick with stone finish, but the detail seems heavy and coarse, — perhaps that is the fault of the drawing, which is not a very good one, and is badly colored. The entrance door, with stair thereto, and the window above it are the best features, the bay-window in the gable to the right being clumsily managed.

No. 1070. A powerfully colored drawing by Mr. F. W. Suggate, of the interior of the grand old chapel of Henry VII. at Westminster. No. 1071. Denton-Hall, Grantham, by Mr. Arthur Blomfield; a large house in late Gothic, very good in style, but rather too much cut up, the whole pile looking more like some institution than a private residence; but the entrance, gable, and tower are striking and well designed. The drawing is in pen-and-ink, and the building is evidently in stone.

No. 1074. Harestone, Surrey, by Mr. Jno. Sulman, a poorly designed country house in the non-fashionable vernacular, not nearly so good architecture as the same author's church work.

No. 1080. School Board Offices, Leeds, and No. 1114, Municipal Buildings and Free Library, Leeds, by Mr. Geo. Corson. A large public building shown in the two views, in freely-treated classic, so much so that the School Board side looks very like a Gothic design in a classic dress, which, however, is not helped by the drawings, which are very liney, lacking in effect of light and shade. It is not nearly so good classic as the Town Hall on the opposite side of the street, a well-known building erected about twenty years ago, which does not say much for the progress of art in Leeds.

No. 1082. Church of St. Mary, Woolwich, by E. F. C. Clarke. A reconstruction (with additions) of an old nondescript church, said additions being in an equally nondescript sort of semi-classic, semi-Romanesque architecture, the reason for the adoption of which is not by any means obvious. This church seems to be rather unfortunate in its renovations. Some time since a design for it by another architect was published in one of the professional journals. It seems on that occasion to have escaped the Scylla of bad Gothic, only to land now on the Charybdis of unsatisfactory classic. It seems to us it would be much better to leave the poor building alone than torture it about in this way. After the above mediocre productions it is a pleasure to turn to No. 1083, Skipness, Argyleshire; a country house in the old Scotch baronial style. All one can say is that if this is a new house, it's remarkably like an old one, so well has its author, Mr. John Honeyman, of Glasgow, caught the spirit and expression of the old work. It is a most careful and artistic study of a style full of strong but picturesque features. The fenestration of the square keep-like central mass, with its quaint corbelled angle turrets, forms an admirable contrast to the tracery-headed windows of the hall — just one of those happy effects one constantly finds in thoroughly good work, whether new or old. The subject is also well drawn and colored, so that it does not suffer, as some designs in the gallery do, from inferior representation.

No. 1089, Exterior, and No. 1097, Interior Views of competitive design for the Oratory at Brompton, by Mr. Geo. Wattress. Very well drawn and colored representations of a somewhat fussy, mixed-up kind of classic, reminding one more of some Spanish cathedral than an English church. In connection with these drawings it is interesting to notice the other designs that are here from the same competition. In No. 1099, we have an Interior of the selected design by Mr. Gribble. (We hear the Exterior was among the rejected. Why?) In No. 1100, an Interior; and in No. 1122, a Longitudinal Section of Mr. Geo. Gilbert Scott's design. In No. 1110, an Interior of Messrs. Goldie & Child's design, and in No. 1157, Mr. A. J. Adams's design. The church is of the dimensions of a small cathedral, and was required to be in the Renaissance style. Some thirty designs were sent in, and Mr. Waterhouse made a report thereon to the Fathers, who ultimately awarded the first prize to Mr. Herbert Gribble, and the second to Mr. Clutton. More than ordinary dissatisfaction was expressed at the result, for many reasons, and Mr. Clutton absolutely declined to receive the second prize which had been awarded to him. This was rather a strong proceeding, but not stronger than the occasion warranted, if the artistic merits of the designs are considered. At all events, here we have five of the designs at Burlington House, and of none of them can it be said, "It is a noble example of the style." Whether it is that our architects have not been trained in the ways of the Renaissance or what not, it is manifest from the examples shown here its true spirit is wanting, and the letter of it is but imperfectly understood. The details and many of the features of these interiors are coarse and ill proportioned, and it may safely be said that what is good of them is n't new, and what is new is not true. It would take up too much space to point out examples of this, though they are many, and they one and all fail to impress us with the fact that they are English churches in the sense that St. Paul's does, as apart from French or Italian versions of the same style. Probably of all the designs Mr. Clutton's, in eighteenth century classic, came nearest to doing this, but those in the Academy may be anything or anywhere. It seems to have been forgotten that we have an Anglo-classic style, as distinct from French or Italian, as our Gothic is from the continental work of the same period; and if this competition is to be taken as any criterion, we have few Renaissance architects amongst us who are capable of designing a great church which would take high rank as a noble work of art among the structures of the world.

We come now to a remarkable series of designs by Messrs. George & Peto, illustrated by most careful and effective drawings. No. 1086, Barrow Point, a house at Pinner; 1087, a coffee-house at Streatham Common; 1140, cottages at Pinner, and 1149, Hillier's Almshouses at Guildford: some of the most charmingly artistic work in the whole collection; quaint without affectation, picturesque without an effort; quiet, peaceful, and thoroughly English in feeling and sentiment. It gives one unmingled pleasure, after the restless productions one sees so much of nowadays, to come across such work as this. The laborers in the cottages, and the old people in the almshouses, must feel completely at home by the chimney-corners of the comfortable rooms Messrs. George & Peto have devised for them. The buildings are a combination of brick with half-timbered bay-windows and gables; the richer parts admirably contrasted with the plainer work; all such features as porches and chimney stacks being made the most of by design, at all times good, and never strained or overdone. No. 1084 is a very careful restoration of Knowle House, Wilts, by Mr. R. H. Carpenter, interesting as a specimen of sixteenth century work of a very English type. In No. 1092, a design for alterations and additions to St. Mary's Church, Monmouth, the first of Mr. Street's contributions meets us. If we had to regret the absence of Mr. Street's brethren of the Academy we must admit he has tried to make up as best he could for their shortcomings in this respect, as he has no less than six drawings on the walls. He thus takes a very liberal advantage of his privilege, and though some of the works are not perhaps of the importance expected from an artist of Mr. Street's high position, they have all his charm of manner, in both design and drawing. Still they are not without faults, perhaps arising from that very manner which is their chief characteristic. We see it in the alterations to the Monmouth Church, where the additions savor more of the Continent than is good for the very English-looking tower and spire of the old church. Again, in No. 1143, a view of St. Margaret's Home, East Grinstead, where the tower of the chapel, which is almost too small for a tower and too large for a turret, is very Frenchy, and not by any means worthy of the chapel to which it belongs. And yet what a wealth of design and beauty of drawing is to be seen in this same St. Margaret's. The Guests' House, the Sisters' House, the Lodge, the Chapel, with the various courts and alleys, grouped with a most masterly hand, all tell of consummate knowledge and artistic skill of the highest order, — and still withal there might be a little more homeliness about the buildings, with advantage to the general effect, not to mention the inmates. Then in No. 1107, we have Mr. Street's church of Holmbury St. Mary, Surrey, a pretty country church, excellent in design and drawing; in No. 1158, his spire of St. Peter's Church, Bournemouth, perhaps the most English-looking tower and spire he has lately done; and in No. 1174, his houses in Cadagon Square; the latter are severe, almost conventual, in style, in striking contrast to the Queen Anne mansions alongside of them, — as if in vigorous protest against the vagaries of our latest revival. All the same, the

latter look the most comfortable to live in and better suited to the wants and requirements of the day. With Mr. Street's works must close our notice for the present. The display on the whole is an encouraging one, and there are several excellent designs yet to be mentioned: notably Mr. Norman Shaw's diploma work; his view of Adcote in Shropshire, the most artistic piece of work in the room, and about which we shall have a few words to say in our next notice.

NEW APARTMENT-HOUSES.

NEW YORK.

A LONG time ago the *American Architect* pointed out the importance of a careful study of the problem of concentrated residences, so to speak, or of making the most of the ground for purposes of dwelling. High and low in society are alike to be provided for in this way. The Five Points has its compact system of tenements, while on Fifth Avenue one sees here and there, from one end to the other, great piles called sometimes by the name of hotels, and in other cases more openly apartment-houses. With the social and sanitary problems involved in these houses we have now little to do. Architecturally there is much to be done before these structures shall express themselves as dwellings without, while they meet adequately and satisfactorily a dozen requirements within. It is peculiar that in the erection of the best class of such houses in the city, the most staring and vivid designs are the most popular. Owners of this class of property are very sensitive in the matter of securing the favor of their tenants. Those who were willing to be lost in the common run of brown-stone fronts when keeping up a separate establishment require, when they look about them for a French-flat apartment, an exterior which to their eye is palace-like. It must be gorgeous, as they interpret the word. It may have a thousand faults, may be inconvenient, cramped, and in some degree unhealthy, but given a few showy items which may be seen at a glance, then all is well. An honest pine or ash finish would be regarded with contempt beside a veneer, conglomerate of cheap mahogany and poor walnut. Brownstone there must be, even if it be but skin deep. A staring metal cornice, too, is considered infinitely superior to a legitimate one in brick or stone. There may be skin-work in the kitchen provided there be plenty of sham grandeur in the parlors. Although there are thousands of people living in this class of houses in this city today, not one of the great piles can boast of honest rolled-beams in the floors, with arches turned in brick. These are not seen, and, of course, are not to be considered in the distribution of the building fund. In public buildings we get some merit. In banks, theatres, warehouses, factories, and churches, the architect is permitted to dictate in a measure the character of the building, but in apartment-houses a cheap gorgeous model has been fixed in the public eye, and follow it the owners will, and follow them the architects must; so that New York has yet to see an apartment-house where the architect has not had, from the very start, this wretched New York ideal kept always before him.

Wm. Field & Son have made a specialty in some measure of apartment-house and tenement designs, and have secured admirable arrangements on the flat, but outside of the plan they wisely, for their pockets' sake, attempt little. The model tenements have been a great success in Brooklyn, and now New York is to have a small one on a plot, 88 feet by 70, at the angle of Corlears and Monroe Streets. It is near the old "Hook," with a good river view. The essential features of the White or Brooklyn houses will be followed in the new block, which is owned by Jackson S. Shultz, the well-known leather merchant. The staircases will be in a tower, with each landing open to the air, built between brick walls, with slate treads and risers and open at the bottom and front to the air. There is no possibility of the stairways becoming a nuisance, nor of the halls becoming a conduit of bad air and foul smells. The balconies leading to the actual room doors are open to the weather in every way, and each door of an apartment, or set of apartments, opens direct to the open air. Each set of apartments has its own water arrangements, and in this edifice, which is five stories high, or sixty-five feet to the cornice line, a set of two or three rooms may be rented for $100 per year, on an average. It is the first of the model tenements in New York, and with care and discrimination in selection of tenants, its success may lead to the erection of many others.

For quite another section of the city Messrs. Field & Son have prepared plans, under direction of Judge C. P. Daly, for a flat house to cover a 50 by 108 feet plot, facing the Central Park from Fifty-ninth Street, with a brick front and elaborate Belleville stone finish. The front is seven storied, and the building will be as fair, architecturally, as any of the cordon of fine residences now drawing about the Park sides. The building is lighted by a recess or well, 12 by 40 feet in area, extending into the building from the south or rear side. This will throw plenty of sunlight into all the rear rooms, while the front will have the Park prospect. The usual elevator and dumb-waiter arrangements are preserved.

At the northeast corner of Fifth Avenue and Forty-second Street, across the avenue from the great "Bristol" flat which the late Griffith Thomas designed, Messrs. Field & Son are to build an apartment-house for Levi P. Morton, whose fine residence is to be demolished to make room for the structure. The plot has a frontage of 27 feet 5 inches on Fifth Avenue, and runs 133 feet along Forty-second Street, and at the easterly end an L, 24 feet wide, runs back 71 feet from Forty-second Street. The site is worth $100,000, and the building is to cost $210,000, since in it nothing is to be spared in securing a thoroughly first-class construction. The building will be seven stories high, or ninety-five feet to the cornice. The plan seizes the opportunity of this prominent corner to carry an angle bay, while other bays break the long front. The first floor will be given up to parlors, the idea being to make it in a measure a "suite hotel."

In all three of these buildings the same criticism holds, that the elevation was made to suit the fancy of the owner or prospective tenant, rather than the real requirements of the problem. The tenement-house is the best of the trio, because here elevation in most respects grew out of the construction of the plan, and the finish was honest and direct, without pretension and with no intention to make things appear other than they are. W.

ROMAN ANTIQUITIES AT LYDNEY PARK, GLOUCESTERSHIRE, ENGLAND.

THE account of the remains at Lydney Park, recently published,[1] is an interesting addition to the printed records already existing of the works left by the early occupants of this country. When the Roman constructions in Lydney Park were first regularly explored (at the beginning of this century), the Right Hon. C. Bathurst, after taking accurate plans and drawings of the several rooms as they successively came to light, composed a detailed description, in two parts, of the villa and the temple. His work displays much knowledge of ancient history and antiquities, is well arranged, and written in a good style; but it has been considered as carried out to too great a length, and too discursive, for the purpose of the present publication. Others have therefore worked upon it, and the whole has been edited by Mr. C. W. King, who has added some theories which greatly increase the interest attaching to these remains.

No regular investigation of these remains was ever made until the year 1805, when some holes having been dug for the purpose of planting trees, which brought to light the foundations of old walls, it was resolved by the late Right Hon. C. Bathurst, who then owned the property, to continue the excavations, in order to trace out the direction of these walls, and the form of the building to which they belonged. This work was carried on for several years, one workman only being usually employed upon it. Every wall was measured as it was brought to light, and laid down on paper; and every pavement was carefully copied, until the whole range of buildings had been discovered.

It would appear from the extent of the buildings, the elegance of some of the pavements, the hypocausts, and the painted stucco with which the walls were adorned, that if this spot was first occupied as a military station, it gradually became the settled residence of a number of persons who gathered around the dwelling of the proconsul, or other officer of high rank.

The series of coins found here, extending from Augustus to Arcadius, would lead to the conclusion that this station was occupied during the whole period of the Roman dominion in Britain, while the large number of them would seem to show that the place must have been vacated in haste; and the marks of fire, with pieces of melted lead found among the ruins, make it probable that the whole was suddenly destroyed, and never again occupied by the inhabitants of the country.

The buildings extended nearly in the direction of north and south, entirely across the hill, the extreme walls on either side standing on the edge of the declivity. The whole breadth in this direction was three hundred feet; the utmost length across, nearly east and west, was three hundred and fifteen feet.

The hypocausts found were merely to warm the various apartments; there are no indications of baths. This, says Mr. King, in another part of the book, was the usual method for warming houses of the better class in cold climates, for the Romans were not acquainted with the use of fireplaces having chimneys; the focus of poorer dwellings being simply a fire made in the middle of a room with a hole in the roof above for the escape of smoke. Julian, in his "Misopogon," tells a curious story that well illustrates the custom. Residing in Paris during a very severe winter, he would never allow his bedchamber to be warmed, "although this could have been done by means of fire under the floor, as the houses in that region are generally constructed." But the frost growing still harder, he was forced to submit; but fearing lest heating the flues suddenly should bring the damp out of the walls, he ordered a brazier of live coals to be carried in, and narrowly escaped suffocation from the fumes.

One of the buildings exposed is supposed to be the remains of a temple, the extreme length of which is ninety-three feet, the breadth seventy-six feet. The remains of such buildings in Britain have not been very frequently found, though altars inscribed with the names of various deities are not unusual. Yet it appears to have been a part of the policy of the Romans, when establishing their authority over the British tribes, to promote the erection of these, as well as other public buildings. We are told by Tacitus, says Mr. Bathurst, from whose account we are condensing these particulars, that Agricola took great pains to encourage the building of temples, public

[1] *Roman Antiquities at Lydney Park, Gloucestershire.* Being a Posthumous Work of the Rev. William Hiley Bathurst, M. A. With Notes by C. W. King, M. A., Fellow of Trinity College, Cambridge. London: Longmans, Green & Co. 1879.

rooms, and private dwellings, in order to civilize the natives, and deter them from their warlike propensities. It is believed that this building was a temple, from the circumstance of three inscriptions having been found within it, two of which are on bronze plates, the third on lead. These are evidently votive tablets, and were probably suspended, or nailed to the wall, in some part of the building.

It is remarkable that in each of the tablets now under consideration the name of the god is spelled differently. The execution of one of them, however, seems superior to the others, besides that the writer of it has a *prænomen*, and may, therefore, be supposed to have been of higher rank and better education than the others. So that, taking his reading as the most correct, it is concluded by the writer that this temple was dedicated to a god named Nodon or Nodons.

The tablet of lead bears a curious inscription, which may be thus translated: "To the god Nodens. Silvianus has lost a ring. He has given the half part to Nodens. Allow health to none amongst (those) who bear the name of Senicianus until he brings (it) even to the temple of Nodens."

The question naturally arises, whether such a deity as Nodons or Nodens was ever heard of in Roman mythology, and this is discussed at some length. Was he, it is asked, a British divinity, adopted by the Romans, as they sometimes were in the habit of doing in regard to the gods of the countries they conquered? Examples of this may be seen in the inscriptions on Roman altars found in Cumberland.

Another conjecture identifies Nodon with Æsculapius, the god who presided over the medical art, and whom the Romans borrowed from the Greeks.

On the dedicatory inscription, which is of peculiar interest to us, worked in the tesselated pavement of the Temple, the copies hitherto published are supposed to be very incorrect in the first and last portions. They give for the opening four letters no more than D. or D. A., and read the concluding letters as INTERAMNATE. But now, with the aid of the accurate drawing made at the time of its discovery, some additional forms can be with certainty restored, and the whole, Mr. King thinks, may be read as follows: —

"D*eo* M*aximo* IT*erum* FLAVIVS
SENILIS PR*aeses* REL*igionis*
EX STIPIBVS POSSVIT
*opitu*LANTE VICTORINO INTER-
prete L*a*TINE."

"To the greatest God, for the second time, Flavius Senilis, Head of the Religion, has erected this, from voluntary contributions, the Director of the works being Victorinus, interpreter for the Latin tongue."

Victorinus, Mr. King thinks, was clearly a man that could turn his hand to anything; like Juvenal's half-starved Greek, he was, as circumstances demanded, —

"Augur, schœnobates, geometres, pictor, aliptes,"

and shone in every capacity.

To his taste and skill the numerous tesselated floors of the villa, with their graceful and varied patterns, bear ample testimony, and lead us to form a high opinion of the temple that rose up under his direction (although nought of its architectural features now survives), pillars and entablature having (as the absence of even their fragments proves) been constructed of oak. — *The Builder.*

THE GRAND CENTRAL DEPOT ROOF AGAIN.

NEW YORK, May 15, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — Notwithstanding the letter of Mr. O. P. Hatfield in your issue of May 3, respecting the part his brother took in the construction of the roof of the Grand Central Depot, I reiterate my statement that Mr. Joseph M. Duclos was the sole designer and constructor thereof. He has the documents necessary to prove his title as the architect of the work. I would ask Mr. Hatfield what he has to show in substantiation of his assertion. Respectfully, H.

NOTES OF EXPERIENCE AND INEXPERIENCE.

23. RED MORTAR. — Red mortar is often made from various substances, such as brick-dust, red earth, and some of the pigments, but the most durable is made of a fine grade of red oxide of iron which retains its color and does not fade. The best way of mixing it is to grind it in distemper and then add to the mortar, which can be made of any desirable color, from light pink to dark red.

NOTES AND CLIPPINGS.

ACCIDENT. — One can hardly believe the newspaper report of an accident which happened in Elizabeth Street, New York, on Friday, May 23. It is stated that a four-story brick tenement-house was in course of demolition, the walls having been taken down to the level of the first story floor, and "most of the bricks were piled on the frail and rotten boarding which formed the floor," thus forming a man-trap of the most vicious kind, which found its victims in four of the score or more boys who were picking up chips among the rubbish, at the time when the main girder broke and let everything drop down to the cellar. As the boys were on top of the bricks, and not in the cellar, they escaped with their lives, though not without serious injuries.

A GERMAN SCHOOL OF ART AT ROME. — The German Government has bought a palace on the Pincian Hill in Rome and has fitted up therein fourteen ateliers and a certain number of lodging-rooms, where German art-students may pursue their studies after the manner of the French students at the Villa Medici.

THE ALBERT MEDAL. — The Council of the Society of Arts has awarded the Albert Medal to Sir William George Armstrong, C. B., D. C. L., F. R. S., "because of his distinction as an engineer and as a scientific man, and because, by the development of the transmission of power — hydraulically, — due to his constant efforts extending over many years, the manufacturers of this country have been greatly aided, and mechanical power beneficially substituted for most laborious and injurious manual labor."

THE DISCOVERIES IN THE FARNESINA GARDENS, ROME. — A correspondent of the New York *Evening Post* writes as follows concerning the newly discovered palace in the Farnesina Gardens which was described in our last issue: —

"I had arranged to visit the excavations with the Director General of the Hydraulic Works of Italy, but an unexpected rise in the Tiber having covered the mosaic pavements, and the rare paintings on the walls having already been removed, I am obliged to accept the description of another. The frescoes on the walls have been taken to the magazine of the Archæological Commission in the Convent of Saint Francesca Romana, but they will soon be placed in the Museo Kircheriano in the Roman College. Those persons who have not seen them in their original position will there be able to examine them at their leisure. Professor Lanciani in his lecture in the University of Rome, last Wednesday morning, discoursed on the antiquities in the bed and on the banks of the Tiber, and said he believed this house was formerly dedicated to the sale of wine. All establishments of a similar kind were anciently in the same quarter of the city, and it may be that this was one of many houses in that part of the city where the delights of Bacchus were enjoyed by Romans. The archæologists say that no discovery of equal importance has been made for centuries in Rome. The walls, first covered with a thick coating of powdered marble, are ornamented with exquisite paintings in a perfect state of preservation. They were evidently made in that period of Rome at the end of the republic or the beginning of the empire, when the art of painting was in the greatest perfection. One of these pictures is an exquisite representation of Bacchus as a child. Near this are two imitations of the ancient style, and there are also two musicians playing the cithara. This is an instrument resembling the modern guitar in form as well as in name. An antique bas-relief in the Hospital of San Giovanni in Laterano also represents this ancient instrument, with cords and frets like the guitar. The cords, however, are longer and the space for the frets smaller, while the player held the thick part of the instrument in the curve of his arm. The Egyptians also used this instrument, and a picture of a man playing upon it is seen in the tombs of Thebes. But this new representation of the cithara has a value which none of those discovered previously possess. Over each cord of the instrument are seen certain letters or signs which are believed to be notes, and if the learned men of the city succeed in reading them we may be able to hear a melody composed two thousand years ago and sung by the merry followers of Bacchus on the shores of the Tiber. It is very probable that in continuing the excavations other rooms will be discovered. Those already found indicate the usual form of an ancient Roman house, which consisted of an interior court, which was open to the sky, surrounded by columns, and to which the rooms inhabited by the family had access. The bases of three columns are seen here, and beyond these is a corridor one hundred feet long and eighteen wide. The room where the paintings were found is on the right of this passage."

THE MEDALLIC HISTORY OF THE UNITED STATES. — As we have not seen the magnificent work of Dr. Loubat, illustrated by one hundred and seventy etchings by M. Jules Jacquemart, since only a small edition was published, we can only speak of it by hearsay, and cannot do better, perhaps, than to repeat a part of what the *Portfolio* says of it. "The collection is complete as a representation of American medals up to date [1878] of publication, and is of great historical interest. A medal voted by Congress is the national honor which in America is the substitute for peerages and orders of knighthood. If the number of recipients is taken into account, it will be evident that such a medal is in fact a far higher expression of national appreciation than anything we have in Europe, except the thanks of Parliament. Only eighty-six medals have been struck by order of Congress, in the course of a century. How many peerages and orders of knighthood have been bestowed even in England (a country not prodigal of honors) in the same space of time! The Legion of Honor is a much more recent institution, yet the number of its recipients may be counted by hundreds of thousands. The work done by M. Jacquemart is simply perfection. We cannot help feeling that when he undertook this enormous labor M. Jacquemart engaged himself, as people do in marriage, 'for better and for worse.' Some of the medals are fine works of art in themselves, others very much the reverse. An action may be noble in itself, and yet a medallist, embarrassed by the conditions of an art which is full of pitfalls for the unwary, may interpert it in such a manner as to make an absurd work of art. Again, nature herself may serve him a bad turn. He has not the choice of the portrait painter; he must exhibit all his faces in profile, and many men of high character and great ability are very unfortunate in their profiles. It is impossible to repress a smile at the angle made by the nose of John Quincy Adams with his forehead! The funniest of the funny medals is that given to Mr. Cyrus W. Field for establishing the Atlantic Telegraph. Mr. Field's head is flying like a bomb at a considerable height above the ocean, and smoke is issuing from the lower part of the neck where the fuse appears to be situated. Below him a terrestrial globe is cut in two halves, like a chain-shot, and we have actually the chain connecting them. It is a comfort to see the halves properly united again on the other side of the medal. It is much to be regretted that nearly all these medals are much injured, artistically, by tasteless lettering. Modern coins and medals are constantly spoiled by vulgar lettering wrought with only too perfect mechanical skill. Antique medals escape this evil, partly because they had far better taste than the moderns in drawing the letters themselves. Real antique Roman lettering, though not nearly so regular as modern type, is seldom if ever inelegant, and the rude letters on Greek coins only make us feel the admirable designing of the heads and figures."

GLASS FLOOR-TILES. — A glass manufactory in Hanover, Germany makes glass which is a close imitation of marble, and tables and floor-tiles made of it are preferred to marble on account of their hardness.